REMARKS

The Office Action of December 6, 2004 was received and carefully reviewed. Reconsideration and withdrawal of the currently pending rejections are requested for the reasons advanced in detail below.

Filed concurrently herewith is a *Request for a Two Month Extension of Time* which extends the shortened statutory period of response to May 6, 2005. Accordingly, Applicants respectfully submit that this response is being timely filed.

Initially, Applicants acknowledge with appreciation the courtesies extended by the Examiner during the Examiner's Interview held on April 7, 2005.

Claims 1-4 and 6-43 were pending prior to the instant amendment. By this amendment, claims 1-3 and 13-14 are amended, and claims 4, 15, 16, 17, 18 are cancelled as the limitation of these claims have been added to the amended independent claims. Further, new claims 44-48 are added to recite a feature from the independent claims that has been removed. Consequently, claims 1-3, 5-14 and 19-48 are currently pending in the instant application, of which claims 1-3, 13 and 14 are independent.

Claims 1-3, 6-8, 11, 19-20, 23, 24, 27, 28, and 37-38 are rejected under 35 U.S.C. 103(a) as being .unpatentable over Yamazaki, U.S. Patent 4,727,044 in view of Silver, U.S. Patent 5104,818 and further in view of Chang, U.S. Patent 5,064,775 and Wolf et al., "Silicon Processing for the VLSI Era Volume 1: Process Technology".

Claims 4-5 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki, U.S. Patent 4,727,044 in view of Silver, U.S. Patent 5,104,818 and further in view of Chang, U.S. Patent 5,064,775 and Wolf et al., "Silicon Processing for the VLSI Era Volume 1: Process Technology" as applied to claims 1-3, 6-8, 11, 19-20, 23-24, 27-28, and 37-38 above, and further in view of Zhang et al., U.S. Patent 5,904,509.

Claims 9-10, 12-14, 21-22, 25-26, 29-30, 31-36, 39-40, and 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki, U.S. Patent 4,727,044 in view of Silver, U.S. Patent 5,104,818 and further in view of Chang, U.S. Patent 5,064,775 and Wolf et al., "Silicon Processing for the VLSI Era Volume I : Process Technology as applied to claims 1-3, 6-8, 11, 19-20, 23-24, 27-28 and 37-38 above, and further in view of Miyasaka, U.S. Patent 6,455,360

Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki, U.S. Patent 4,727,044 in view of Silver, U.S. Patent 5,104,818 and further in view of Chang, U.S. Patent 5,064,775 and Wolf et al., "Silicon Processing for the VLSI Era Volume I : Process Technology" and Miyasaka, U.S. Patent 6,455,360 as applied to claims 9-10, 12-14, 21-22, 25-26, 29-30, 31-36, 39-40, and 41-43 above, and further in view of Zhang et al., U.S. Patent 5,904,509. Each of these rejections is traversed for the reasons advanced in detail below.

In addition to those arguments set forth in Applicant's response of August 26, 2004, those arguments incorporated by reference herein, the present invention is distinguishable from the cited art of record by recognizing that ion-doping without mass separation can be used for adding an impurity to a channel region when using an impurity gas diluted with hydrogen at a concentration of 0.5 to 5%.

Yamazaki discloses that "in the formation of the semiconductor layer 2', a concentration of oxygen, nitrogen, or carbon,..., is not contained therein a large amount exceeding $5*10^{18}$ atom/cm^3...". That is, Yamazaki appears to disclose the general matter of the concentration of a channel region. However, Yamazaki does not disclose a channel doping and an ion-doping without mass separation. Hence, Yamazaki does not recognize the problem relating to contamination of C, O, and N caused by ion-doping without mass separation. Therefore, Applicants do not believe that the combination of Yamazaki, Silver, Chang, Wolf et al. Zhang et al., and Miyasaka leads to the present invention.

Specifically, Silver and Chang disclose an implantation of the channel region, Wolf discloses implantation through an insulating film, Zhang and Miyasaka appear to disclose ion-doping without mass separation, and Miyasaka appears to disclose diluting diborane with hydrogen at a concentration of 0.1 to 10%. However, all of them do not recognize that there is a problem that is a contamination of C, 0, and N caused by ion-doping without mass separation.

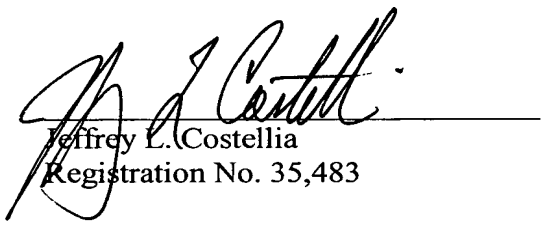
In the present invention, inventors of the present invention recognized that ion-doping with an impurity gas diluted with hydrogen at a concentration 0.1% has the problem that is a contamination of C, 0, and N due to a long doping time when the ion-doping is performed to a channel region. In addition, it is disclosed that ion-doping with the impurity gas diluted

with hydrogen at a concentration 10% is difficult to control because doping time is quite short. Based on these problems, we disclose that ion-doping without mass separation can be used to channel region with little contamination of C, O, and N (claims 1, 2, 3) according to set a concentration of an impurity gas diluted with hydrogen at 0.5-5%, or hydrogen as recited in claim 13.

By recognizing the solution to the above problem of C, O and N contamination, unexpected results are obtained utilizing hydrogen at the claimed concentration, as explained in detail beginning on page 11 to the top of page 14 of the specification. More particularly, the specification on pages 13-14 indicates that results are significantly improved if the impurity element is diluted with hydrogen at a concentration of 0.5% to 5%. The results show that .1% , more hydrogen atoms are added to the semiconductor layer, where 5 % was deemed to provide very good results. Figures 1-3 also provide further evidence of the consistent level of C, O and N concentrations when the method of the present invention is employed. Consequently, the cited art of record fails to teach or suggest the problems associated with the use of ion-doping for forming a channel region, particularly when using no mass separation. By providing an impurity element diluted with hydrogen at a concentration range of 0.5 to 5% when using ion-doping and no mass separation, a semiconductor device having improved characteristics (claim 14) can be obtained, or more particularly, a device having a low concentration of C, O and N can be obtained (claims 1, 2, 3) or H (claim 13).

In view of the foregoing, it is respectfully requested that the rejections of record be reconsidered and withdrawn by the Examiner, that claims 1-3, 5-14 and 19-43 be allowed and that the application be passed to issue. If a conference would expedite prosecution of the instant application, the Examiner is hereby invited to telephone the undersigned to arrange such a conference.

Respectfully submitted,



Jeffrey L. Costellia
Registration No. 35,483

NIXON PEABODY LLP
Suite 900, 401 9th Street, N.W.
Washington, D.C. 20004-2128
(202) 585-8000